TACCIMO
Template for Assessing Climate Change Impacts and Management Options

TACCIMO REPORT COVER SHEET

REPORT DESCRIPTION

TACCIMO-SLAMM Report
Report Date: 6-12-2013
Location: Francis Marion National Forest

HOW TO CITE INFORMATION IN THIS REPORT

The following sources should be directly cited when discussing or summarizing results in this report.

SLAMM Model:
Clough, J.S. 2008. SLAMM 5.0.1. Technical documentation and executable program downloadable from http://www.warrenpinnacle.com/prof/SLAMM/index.html.

Park, R.A., T.V. Armentano, and C.L. Cloonan. 1986. Predicting the Effects of Sea Level Rise on Coastal Wetlands. Pages 129-152 in J.G. Titus, ed. *Effects of Changes in Stratospheric Ozone and Global Climate, Vol. 4: Sea Level Rise*. US Environmental Protection Agency, Washington, DC.

Rubino, M.J. 2009. Sea Level Rise Modeling for the SAMBI Designing Sustainable Landscapes Project. Technical documentation and data downloadable from http://www.basic.ncsu.edu/dsl/slr.html.

This report was generated by the TACCIMO tool and may be acknowledged using the name and date listed above, along with the TACCIMO website (www.taccimo.sgcp.ncsu.edu).

BEST AVAILABLE SCIENTIFIC INFORMATION

The scientific information summarized within this report is drawn from the most robust sea level rise model projections available for the region (Clough 2008, Park et al. 1986, Rubino 2009). Unlike simple inundation (or “bathtub”) models, these projections take into account geomorphological processes such as accretion, erosion, and marsh migration dynamics.

NEXT STEPS

Review the results contained in the SLAMM report and consider model uncertainty due to limitations in input datasets and incomplete knowledge about the systems being modeled (Clough 2008). Consult the technical documentation for the SLAMM model (Clough 2008) for information on model assumptions, limitations, and uncertainty. Present the information summarized in this report to specialists on your team and request feedback as it pertains to specific landcover classes and related species of interest or concern. Consult with local experts and stakeholders to further evaluate the merit and implications of this information. For methods and criteria on the inclusion of geospatial content in TACCIMO, see the TACCIMO user guide, section Science: Geospatial–Projections and Models.

REPORT STORAGE/ARCHIVAL

This report may be appropriate as an appendix to a specialized analysis or may be included in an administrative record.

TACCIMO-SLAMM Report: Francis Marion National Forest

Date: 2-12-2013

OVERVIEW

This report summarizes landcover changes driven by sea level rise as predicted by the Sea Level Rise Affecting Marshes Model (SLAMM; Park et al. 1986), which was parameterized and run by the Biodiversity and Spatial Information Center (BaSIC) at North Carolina State University. SLAMM simulates geomorphological processes (i.e., accretion, erosion, and marsh migration) and is thus considered a more robust way to consider impacts of sea level rise when compared with "bathtub" models that simply account for inundation.

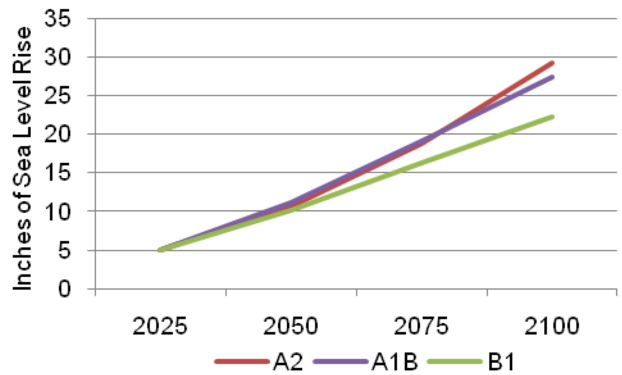


Figure 1—Rate and amount of sea level rise for the three most commonly referenced IPCC emissions scenarios (IPCC 2001)

BaSIC used SLAMM version 5.0.1 (Clough 2008) for the South Atlantic Migratory Bird Initiative (SAMBI) geographic planning region and parameterized the model with the following regionally specific inputs: (1) National Wetland Inventory, (2) digital elevation model (DEM; 30 meter), (3) slope derived from the DEM, (4) impervious surface data, (5) tidal datum information, and (6) historic sea level rise trend data (Rubino 2009). For additional general details describing the SLAMM model see its user guide (Clough 2008).

RESULTS

The following SLAMM results are summarized for the Francis Marion National Forest based on analysis of results corresponding to the A2 (high emissions) sea level rise scenario from the Intergovernmental Panel on Climate Change (IPCC 2001; fig. 1):

- The geographic distribution of land cover classes, including a map highlighting areas predicted to experience varying degrees of change, are included in figure 2. Total number of acres in each landcover class for each time period considered (2000, 2050, and 2100) are summarized in table 1.
- Predicted landcover change between 2000 and 2050 is dominated by conversion of upland undeveloped to scrub/shrub transitional marsh (fig. 3). The latter half the century (2050-2100) is characterized by more gradual conversion of scrub/shrub transitional marsh to other conditions, including salt marsh (fig. 3).
- The number of acres transitioning from one landcover class to another (e.g., upland undeveloped to swamp) for 2000-2050 and 2050-2100 are included in table 2 and 3 respectively.

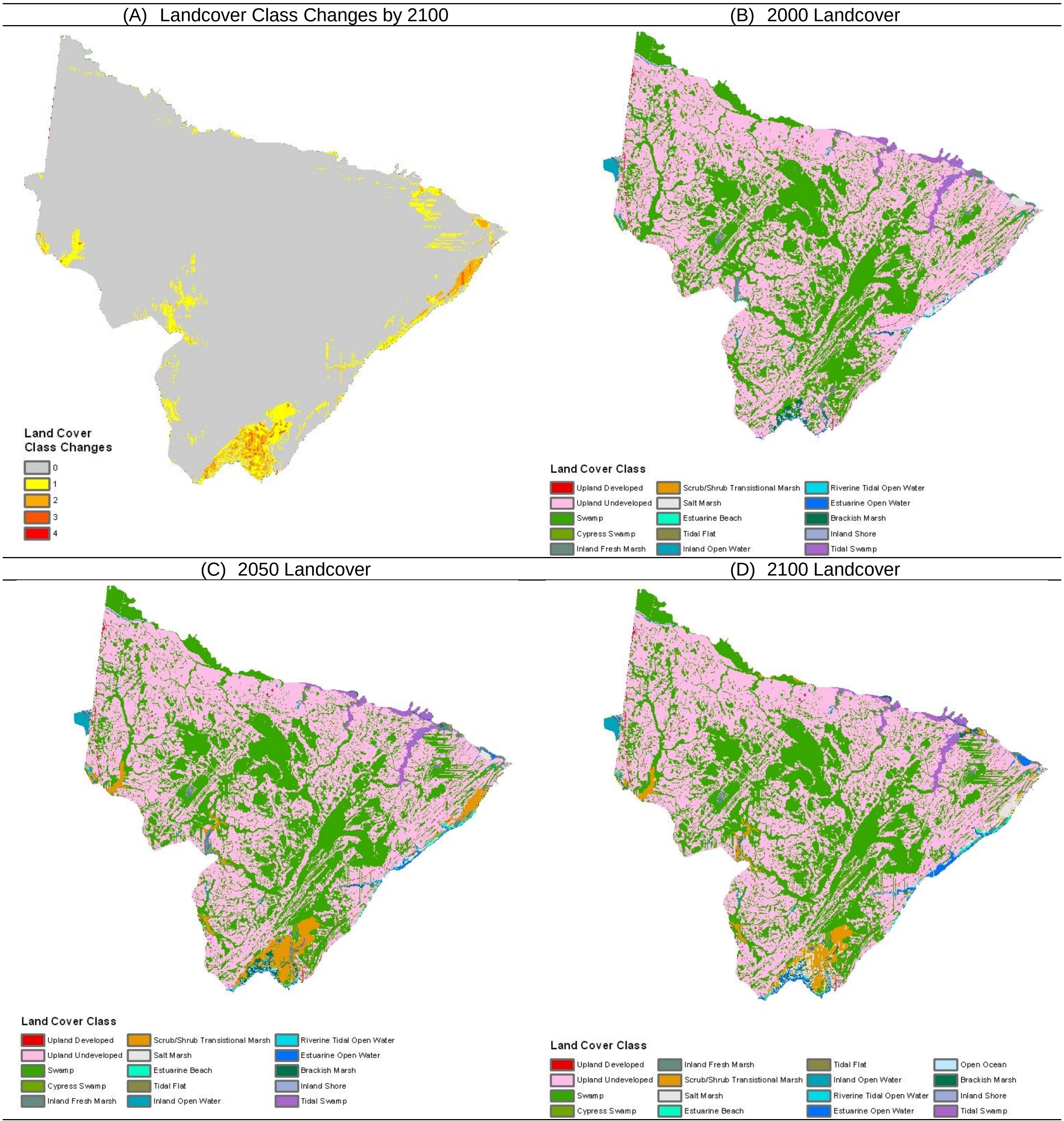
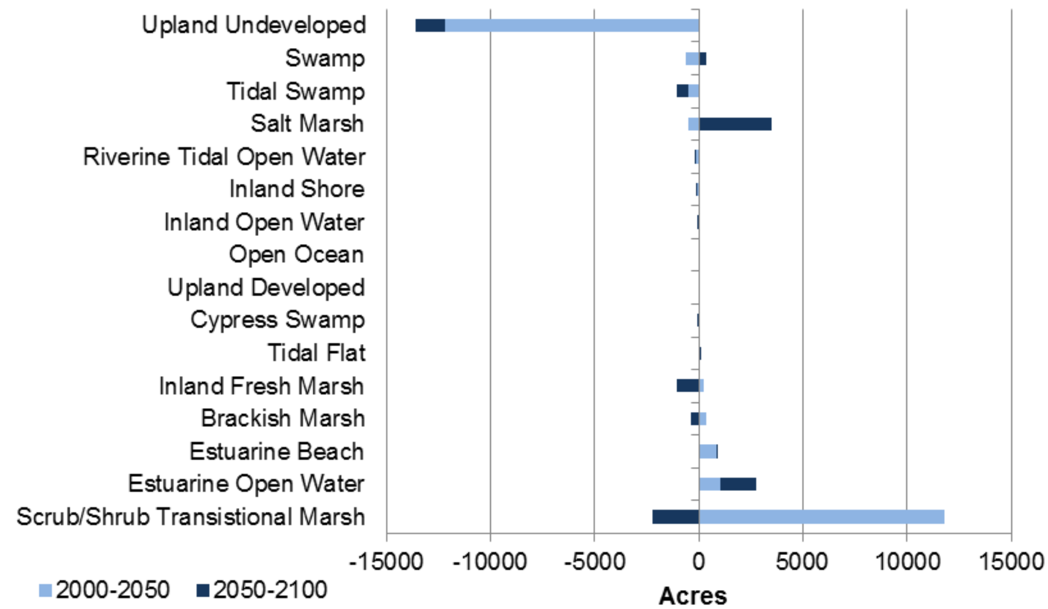


Figure 2—Change in landcover class by 2100 (A) and geographic distribution of landcover classes at 2000 (B), 2050 (C), and 2100 (D)

Table 1—Distribution of acres in each landcover class at 2000, 2050, and 2100

Landcover Class	2000		2050		2100	
	Proclamation	Administrative	Proclamation	Administrative	Proclamation	Administrative
	----------acres----------					
Upland Undeveloped	238724	134395	230900	131503	229486	131086
Swamp	157559	115274	153406	113613	153781	113608
Tidal Swamp	6064	5194	5682	4906	5109	4562
Inland Fresh Marsh	3850	844	3829	852	2745	740
Inland Open Water	2242	163	2215	149	2200	144
Salt Marsh	2221	803	1809	700	5272	2197
Brackish Marsh	1855	1321	2092	1513	1716	1198
Upland Developed	1594	335	1594	335	1594	335
Cypress Swamp	989	453	895	452	894	452
Estuarine Open Water	622	227	1443	489	3186	1220
Scrub/Shrub Transitional Marsh	569	284	11828	4702	9605	3655
Riverine Tidal Open Water	277	86	136	57	77	36
Estuarine Beach	226	48	919	163	999	188
Inland Shore	25	14	25	14	24	13
Tidal Flat	11	9	57	2	121	16
Open Ocean	0	0	0	0	20	0

Proclamation



Administrative

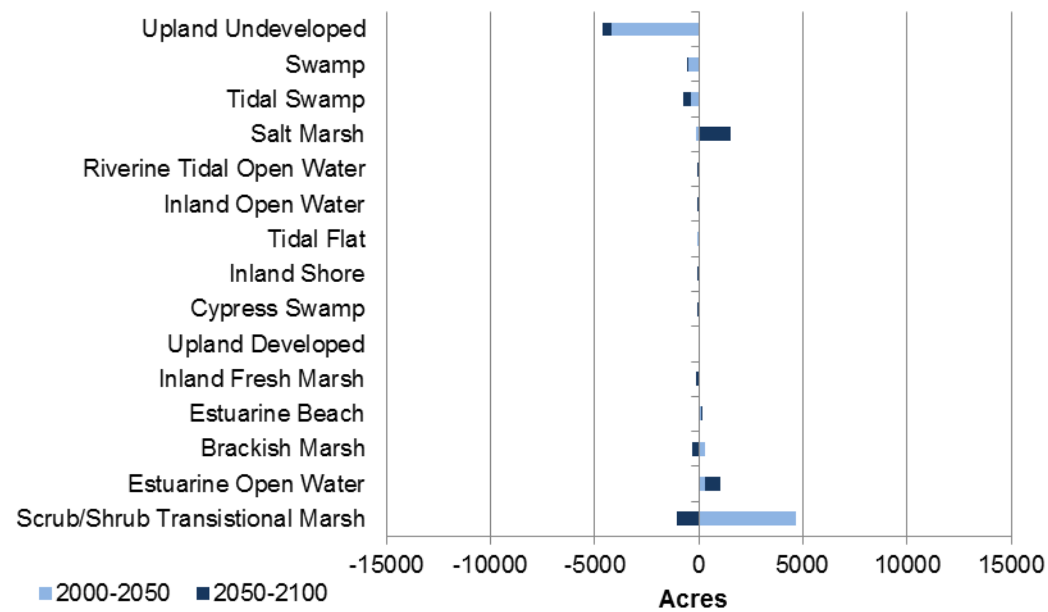


Figure 3—Change in landcover classification between 2000-2050 and 2050-2100

Table 2—Change in landcover class from an initial (2000) to a novel condition by 2050

2000 Landcover Class	2050 Landcover Class	Change 2000-2050 (acres)	
		Proclamation	Administrative
Swamp	Scrub/Shrub Transitional Marsh	6608	2938
Upland Undeveloped	Swamp	5907	2406
Upland Undeveloped	Scrub/Shrub Transitional Marsh	5058	1714
Upland Undeveloped	Estuarine Beach	846	140
Salt Marsh	Estuarine Open Water	616	242
Tidal Swamp	Brackish Marsh	516	397
Upland Undeveloped	Inland Fresh Marsh	346	40
Brackish Marsh	Salt Marsh	146	96
Riverine Tidal Open Water	Estuarine Open Water	144	29
Upland Undeveloped	Cypress Swamp	116	0
Inland Fresh Marsh	Scrub/Shrub Transitional Marsh	111	16
Cypress Swamp	Estuarine Open Water	89	1
Salt Marsh	Tidal Flat	57	2
Inland Shore	Estuarine Open Water	48	10
Inland Open Water	Estuarine Open Water	43	15
Tidal Flat	Estuarine Open Water	26	15
Estuarine Beach	Estuarine Open Water	25	6
Scrub/Shrub Transitional Marsh	Salt Marsh	15	8
Upland Undeveloped	Estuarine Open Water	10	0
Upland Undeveloped	Inland Open Water	3	0

Note: (1) Areas that remained in their original landcover classification are omitted; (2) Areas of change that are less than 1 acre are omitted

Table 3—Change in landcover class from an initial (2050) to a novel condition by 2100

2050 Landcover Class	2100 Landcover Class	Change 2050-2100 (acres)	
		Proclamation	Administrative
Scrub/Shrub Transitional Marsh	Salt Marsh	4185	1534
Salt Marsh	Estuarine Open Water	1332	543
Inland Fresh Marsh	Scrub/Shrub Transitional Marsh	1128	153
Upland Undeveloped	Swamp	983	240
Brackish Marsh	Salt Marsh	708	507
Swamp	Scrub/Shrub Transitional Marsh	601	243
Tidal Swamp	Brackish Marsh	572	344
Salt Marsh	Salt Marsh	363	151
Upland Undeveloped	Scrub/Shrub Transitional Marsh	246	97
Brackish Marsh	Estuarine Open Water	227	141
Upland Undeveloped	Estuarine Beach	132	39
Salt Marsh	Tidal Flat	107	5
Estuarine Beach	Estuarine Open Water	64	17
Riverine Tidal Open Water	Estuarine Open Water	59	21
Tidal Flat	Estuarine Open Water	57	2
Upland Undeveloped	Inland Fresh Marsh	52	41
Inland Open Water	Estuarine Open Water	16	4
Brackish Marsh	Tidal Flat	14	10
Estuarine Open Water	Open Ocean	13	0
Scrub/Shrub Transitional Marsh	Estuarine Beach	12	3
Inland Fresh Marsh	Salt Marsh	8	1
Salt Marsh	Open Ocean	8	0
Swamp	Salt Marsh	5	2
Inland Shore	Estuarine Open Water	1	1
Upland Undeveloped	Salt Marsh	1	0

Note: (1) Areas that remained in their original landcover classification are omitted; (2) Areas of change that are less than 1 acre are omitted

LITERATURE CITED

Clough, J.S. 2008. SLAMM 5.0.1. Technical documentation and executable program downloadable from http://www.warrenpinnacle.com/prof/SLAMM/index.html.

IPCC, 2001. Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change [Houghton, J.T.,Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, X. Dai, K.Maskell, and C.A. Johnson (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 881pp.

Park, R.A., T.V. Armentano, and C.L. Cloonan. 1986. Predicting the Effects of Sea Level Rise on Coastal Wetlands. Pages 129-152 in J.G. Titus, ed. *Effects of Changes in Stratospheric Ozone and Global Climate, Vol. 4: Sea Level Rise*. U.S. Environmental Protection Agency, Washington, D.C.

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	SLAMM													
Ecological Approximation (4/2013)	Swamp	Cypress Swamp	Inland Fresh Marsh	Scrub/Shrub Transitional Marsh	Salt Marsh	Estuarine Beach	Tidal Flat	Inland Open Water	Riverine Tidal Open Water	Estuarine Open Water	Brackish Marsh	Inland Shore	Tidal Swamp	Row Total
Nonriverine Swamp and Wet Hardwood Forest	73971	374	895	15	9	0	0	155	1	1	41	0	380	113740
Wet Pine Savanna and Flatwoods (Wet Phase)	17936	20	157	0	0	0	0	20	0	0	2	30	66	45549
Small Blackwater River Floodplain Forest _and_Blac	16240	66	67	0	0	0	0	337	75	0	0	2	263	19097
Wet Pine Savanna and Flatwoods (Mesic to Wet Phase)	14061	16	210	0	9	1	1	100	0	2	7	16	14	92753
Upland Longleaf Pine Woodland (Dry-Mesic to Mesic	9401	23	312	2	4	0	0	104	0	1	5	21	85	69896
Large River Floodplain Forest	6753	0	9	0	0	0	0	186	7	0	0	2	1085	8629
Tidal Wooded Swamp	2903	6	423	2	0	0	0	18	109	0	6	0	3946	7855
Carolina Bay Wetland	2777	62	31	0	0	0	0	7	0	0	0	0	0	4514
Nonriverine Basin Swamp	2646	0	0	0	0	0	0	0	0	0	0	0	0	2745
Peatland Pocosin and Canebrake (Typic Phase)	2006	7	1	0	0	0	0	0	0	0	0	0	0	2025
Upland Longleaf Pine Woodland (Dry to Dry-Mesic Phase)	1722	20	35	0	5	0	0	22	0	0	3	2	130	20647
Upland Longleaf Pine Woodland (Xeric to Dry Phase)	1484	8	45	4	11	0	0	26	0	1	4	0	14	15547
Depression Pond (Typic Phase)	1058	15	30	0	0	0	0	29	0	0	0	0	0	2096
Peatland Pocosin and Canebrake (Carolina Bay Phase)	237	0	11	0	0	0	0	0	0	0	0	0	0	268
Water	159	250	30	0	1	0	0	1091	0	2	1	0	5	1642
Salt and Brackish Tidal Marsh	134	0	1237	28	2254	79	24	104	81	414	1626	0	101	6621
Mesic Slope Forest	128	0	0	0	0	0	0	0	0	0	0	0	13	226
Dry and Dry-Mesic Oak Forest	106	0	0	0	0	0	0	0	0	0	0	0	36	1105
Depression Pond (Sink Phase)	86	0	6	0	0	0	0	5	0	0	0	0	0	333
Maritime Forest	71	0	13	11	6	11	1	2	1	1	25	0	29	477
Streamhead Seepage Swamp, Pocosin and Baygall	66	0	0	0	0	0	0	0	0	0	0	0	0	75
Altered Land	53	0	71	0	2	6	0	34	0	1	0	0	8	552
Column Total	153996	867	3585	63	2301	98	26	2240	275	423	1719	73	6175	416391